Chapter

Introductory Chapter: Biological Anthropology

Alessio Vovlas

1. Introduction

Biological anthropology, or physical anthropology, is a discipline divided into several different branches [1]. In this book, remarkable experts in anthropology have dedicated illustrative chapters on different sectors of the discipline. Each chapter presents a case study and the applications of the most interesting specific techniques. Each chapter offers a widespread diversity of topics covering the broader subjects of biological anthropology, providing an extensive sample of the applications of several methods in anthropology.

This volume intends to provide to the reader an overview of the contemporary state-of-the-art in some different aspects of biological anthropology, in specific in bioarchaeology and paleopathology and forensic anthropology. It could be an important resource for the scientific community that belongs to this discipline, such as evolutionary biologists, ecologists, medical researchers or a starting point for exploring these practices by students.

2. Bioarchaeology

Bioarchaeology is the study of human and animal remains. The term was first proposed by Grahame Clark to designate the studies of animal bones from archaeological sites [2]. Since the end of the '70s the term bioarchaeology is used within the meaning of human osteoarchaeology. The bioarcheological investigation is focused on the study of human variation and evolution in earlier society, using specific methods and techniques in osteological analysis from the mortuary context in archaeological records [3]. Skeletal and dental remains offer an important source of biological information offer for interpreting lifeway of past peoples. Skeletons can provide insight into living conditions, health status, disease, dietary history, lifestyle, violence, trauma, ancestry and demography [4] from individual to population perspective.

Bioarchaeology manifest itself the strict connection between culture and biology [5] and, as Goodman said, one would not exist without the other [6]. This integrative and interdisciplinary research mixed traditional macroscopic skeletal analysis [7, 8] (for estimating biological profile i.e. age, sex, ancestry, stature), bone chemistry [4, 9], ancient DNA [10] with grave contexts, local legends, sagas and other historical information [11] with which to address questions about past populations. In its book "Skeletons in our closet", C.S. Larsen said: "*If only the dead could talk [...] they could tell us about their lives, the food they ate, the disease they experienced and the stress they have encountered [...] bones and teeth bear the physical signs of a person's diet, disease, stress and lifestyle - the skeleton is the "voice" from the past*" [12].

Over the past few decades, new methods and technological innovation providing remarkable strategies to exploring past human relationship and activities [13]. For example, computational and statistical methods [14], computer-based methodologies (e.g. 3D face reconstruction) [15] or analytical procedures for identifying isotopes and biomolecules [13] in biological material excavated in archaeological sites have become very popular in the studies of this discipline. The use isotopic analysis of bones and teeth has exploded over the past few decades to the point where it is now an established tool that is routinely used to investigate questions relating to diet and mobility [16] and for radiocarbon dating, climate and habitat reconstruction [9, 17].

The chapter "Anthropological and paleodietary analysis of human temains: a case study from the teutonic settlement of Torre Alemanna in Puglia (Cerignola, FG, Italy)" illustrates how craniological and craniometric analysis, study of nutritional and occupational stress markers allows to understand the interaction between man and environment, and how we can use this knowledge to reconstruct the *modus vivendi* of people who lived in the past.

3. Paleopathology

Paleopathology is strictly connected with bioarchaeology. Paleopathology entails the study of ancient human disease [18] from human bones and mummies. The paleopathological investigation provides fundamental understanding concerning the antiquity of some diseases and their dissemination in past human groups [19]. Human lives changed drastically over the last hundred years and these temporal changes in human lifestyles are detectable in the skeletal records. Osteological and biological markers highlight to the paleopathologists the pathological condition of past populations, affected by consistent anatomical alteration like trauma, dental disease, activity or mechanical stress, osteoarthritis, tumours [20–23]. Paleopathology need a profoundly interdisciplinary endeavour, encompassing aspects of the biomedical science, the humanities, and the social sciences [24]. Understanding ancient diseases is strictly connected with clinical science, with its process of paleopathological problem solving, the practice of differential diagnosis and the construction of diagnostic arguments [25, 26].

Diagnostic criteria can be applied to evaluate inflammation, surgical intervention (e.g. cranial trepanation) or infections of pathogenic microorganisms in the past, like Tuberculosis [27, 28], Leprosy [29, 30], Treponematosis [31], Brucellosis [32].

Paleopathology requires also a consistent biochemistry approach. The use of isotope provides evidence of metabolic disease and nutritional deficiencies, like vitamin deficiencies in a disease like rickets [33], scurvy [34, 35] and pellagra [36].

The chapters "Cranial trepanation: case studies between the IV century BC and VI century in southern Italy" and "Anthropological and palaeopathological study of a skeleton from late Roman Sicily" explore ancient evidences of human disease. Furthermore, examining osteological alteration in human remains could indicate a crucial element in finding ways to address the world's major health problems of the 21st century.

4. Forensic anthropology

The study of human remains is not limited only to ancient finds. In recent years *forensic anthropology* emerged and assumed the configuration of an important

applied subfield within biological anthropology, by the application of studies on the modern human skeleton to the legal process. Data and interpretations offered by forensic anthropologists have contributed in critical ways to the solutions of many medicolegal problems [37]. Forensic anthropologists operate with their know-how in laboratory-based analysis and episodic involvement in forensic cases [38] or to address legal issues to establish personal identification by human identifying.

Technological advances represent a key potential for improved capability in scientific identification of human remains recovered in a medicolegal context [39].

In addition to age, sex, stature, ancestry determination is it possible to carry out analysis for facial, dental and soft tissues identification. Scientific progress allowed the application of these technologies in crime context as homicide, mass-fatality disasters, genocide. Forensic anthropologists can thus provide Technical services to medical examiners, like cranial and post-cranial evidence, anatomical and biological profile based on *ante-*, *peri-* and *post-mortem* conditions [40].

In recent years DNA analysis, radiographic evaluations of skeletal details, computerized tomography (CT) are becoming increasingly used in the field of forensic anthropology. Also, DNA sequencing, blood genetics, fingerprints provide invaluable assistance in the identification of victims and perpetrators of crimes [41].

The chapter "Forensic anthropology" presented here focus on applied aspects of forensic anthropology analysis and how forensic anthropologist can contribute to an investigation.

Moving from Mirko Grmek naturalistic approach to the history of medicine [42], is possible to link his concept of "pathocenosis" to the evolutionary perspective. In the broad area of study that anthropology covers, a multidisciplinary approach can provide us with a wealth of information on various issues. Biological issues, faced by comparing, for example, how pathologies have coexisted with humans over time, can provide us with useful information. We can therefore study not only how the daily life of *Homo sapiens* has changed over time or understand how the environment has influenced human beings, but also catalogue and make available all the information on the relationship between natural landscape and man that is so much taken into consideration today [43]. We hope this book will be of support not only to experts in the field but also to curious young people eager to undertake these fascinating and fundamental disciplines of study.

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Author details

Alessio Vovlas[1,2]

1 Laboratory of Anthropology, Department of Biology, "Aldo Moro" University of Bari, Bari, Italy

2 Aps Polyxena, Conversano (Bari), Italy

*Address all correspondence to: alessiovovlas@email.it

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